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## **CLUSTER OF NONTUBERCULOUS MYCOBACTERIA SKIN INFECTIONS FROM TATTOOS**

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14. ABSTRACT In July 2008, the owner of a local tattoo parlor notified the San Antonio Metropolitan Health District (SAMHD) about 11 people who had developed adverse reactions shortly after receiving tattoos. Customers reported a constellation of symptoms of prolonged, erythematous, papular eruptions that were localized only to the gray (shaded) portions of their tattoos. An investigation conducted by SAMHD revealed these eruptions to be nontuberculous mycobacteria (NTM) skin infections caused by contaminated ink. The NTM organisms discovered from tissue cultures were <i>M. abscessus</i> and <i>M. chelonae</i> . NTM skin infections are not only difficult to diagnose, they are difficult to treat. After 6 months, 6 of the 11 patients still had a persistent, papular rash in the gray portion of their tattoo, 2 had complete resolution of their initial dermatologic condition, and 3 could not be contacted for followup. To reduce the incidence of adverse reactions, tattooing may need to be more carefully regulated. Perhaps at the state and/or federal level, tattoo artists could be asked/required to receive annual training (they already receive initial training) in the field of infection control/sterile technique while practicing their art. This would be in similar fashion to physicians being required to earn continuing medical education in their own fields.					
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In July 2008, the owner of a local tattoo parlor notified the San Antonio Metropolitan Health District (SAMHD) about 11 people who had developed adverse reactions shortly after receiving tattoos. Customers reported a constellation of symptoms of prolonged, erythematous, papular eruptions that were localized only to the gray (shaded) portions of their tattoos. This cluster resembles a recent French case report in which eight individuals who received tattoos at a tattoo parlor in Grenoble developed atypical mycobacterial infections after tattooing in 2005. Interestingly, the dermatologic manifestations were confined to the gray portions of their tattoos, in a similar fashion to our own investigation (Ref 1).

SAMHD began the investigation by inspecting the tattoo parlor and interviewing the artist, patients, and their physicians. The investigators inspected the tattoo parlor for cleanliness and other obvious signs that would indicate unhealthy or unsanitary procedures. No basic sanitation concerns were identified. The tattooing process includes three steps to mitigate patient-to-patient transfer of infectious agents or tattoo-artist-to patient transfer: (1) ink is placed in a single-use container that is discarded after use, (2) sterile, single-use needles are used and discarded between clients, and (3) an autoclave is onsite and is used to sterilize the stainless steel needle driver and other necessary equipment. When interviewed, the proprietor explained the tattooing process, the exact procedures he would follow, and the equipment used. He demonstrated how he would initially prepare the skin by cleansing the area to be tattooed with isopropyl alcohol wipes. He explained that he would wash his hands thoroughly between patients and wear single-use, disposable, sterile surgical gloves which, along with the single-use ink containers, would be discarded. He would autoclave the nondisposable equipment, such as the stainless steel needle drivers, and thoroughly clean the tattoo table with a germicidal chemical after each use.

The owner recalled that the ink used on the 11 clients came from a shipping container that contained gray ink, and there had been some leakage into the container. The individual bottles had no lot numbers for traceability. The ink was called "Dragon's Blood Gray"; it was manufactured in New Jersey but had been sent to a distributor in California before being mailed to the proprietor in San Antonio.

In this investigation a case was defined as any customer (patient) of the tattoo parlor who developed pruritic, erythematous, raised, or papular eruptions of the skin, confined to the gray areas of the tattoo, during the summer months of 2008. All 11 of the customers affected received tattoos during July and August 2008, and in every case the erythematous papules developed between 4 days and 2 weeks following the tattoo procedure. All of these patients complained to the tattoo parlor proprietor, who provided their names and contact information to the investigators. The tattoo parlor proprietor was more than helpful to provide this information on those 11 symptomatic customers. However, he seemed reluctant to provide the names and contact information of any other customers apparently not affected. The investigators decided not to press him on the issue to more readily maintain a cooperative relationship and concentrated their efforts on those 11 customers who had received the Dragon's Blood Gray pigments in their tattoos. That ink had originated from the same large bottle that had leaked in the shipping container. The investigators attempted to reach all 11 people by telephone for interviews as to their specific circumstances, but only 10 were contacted and interviewed. Six of the 11 patients were actually seen by a physician.

The information collected during these telephone interviews included a standard questionnaire used by SAMHD for such outbreak investigations that was modified slightly and included name, gender, age, date of tattoo, onset of symptoms, date seen by physician if applicable, clinical findings seen by the physician, treatment rendered by physician, and outcome (Table 1). Initial interviews were conducted in July of 2008, and followup interviews were conducted in January of 2009. Details included time and exact location of tattoo, location within the tattoo of the reaction (i.e., area affected), treatments used whether lay or professional, and current status of the eruption. All patients who were seen by a physician gave consent for the SAMHD investigators to contact their physicians for additional information.

**Table 1. Demographic Information Summary of 11 Symptomatic Patients (All Males)**

Age (yr)	Date of Tattoo (2008)	Delay of Onset (days)	Date of Presentation (2008)	Clinical Findings	Physician Consultation	Treatment	Outcome
23	19 Jul	5	24 Jul	Erythematous papules x 5 mo	None	Septra DS x 10 days, Bacitracin daily since	Rash present 5 mo later
27	24 Jul	14	7 Aug	Erythematous papules x 3 mo	Primary care	Oral antibiotics	Resolved entirely
27	29 Jul	7	5 Aug	Intermittent erythematous papules	Primary care	Oral Clarithromycin, steroid cream	Rash present 5 mo later - intermittent severity
?	30 Jul	8	7 Aug	Joint pain & swelling, "bacterial skin infection"	Infectious diseases, dermatology, rheumatology	Oral antibiotics, oral steroids	Unknown
29	1 Aug	4	5 Aug	Erythematous papules x 4 mo	None	Doxycycline, hydrocortisone cream	Resolved entirely
?	2 Aug	15	17 Aug	Rash	Primary care	Cephalexin 500 BID, steroid cream	Unknown
33	8 Aug	7	15 Aug	Itching, erythematous papules, hypopigmented areas	Primary care	Bactrim, steroid cream	Rash present 5 mo later but less severe
23	22-30 Aug	8-16	7 Sep	Itching, erythematous papules	Primary care, infectious diseases, dermatology	Three courses Minocycline	Rash present 5 mo later
24	23 Aug	7	30 Aug	Intermittent erythematous papules	None	Bacitracin	Rash present 5 mo later - intermittent severity
?	2 Sep	7	9 Sep	Rash	None	Amoxicillin	Unknown
43	5 Aug	14	19 Aug	Itching, erythematous papules	None	None	Rash present 5 mo later but less severe

One patient had a skin biopsy from the inflamed, gray portion of the tattoo. The biopsy revealed a diffuse, mixed inflammatory infiltrate composed of lymphocytes, histiocytes, and neutrophils associated with black, granular, and particulate pigment consistent with a tattoo. The lack of significant spongiosis and eosinophils suggested a primary exzematous dermatitis such as allergic contact dermatitis. Additional sections and stains were prepared to exclude an infectious etiology. The additional sections failed to reveal evidence of preexisting folliculitis or cyst. Stains for organisms were negative. Tissue homogenate for culture was found to be positive for growth of *M. abscessus* and *M. chelonae*. No acid-fast bacillus was found on direct smear of the ink. NTM was identified, however, by high performance liquid chromatography.

Culture results of the ink from the same bottle used by the proprietor/tattoo artist on the 11 patients (Dragon's Blood Gray) were positive for the AFB organisms *M. abscessus* and *M. chelonae*. The investigators asked for any other bottles of Dragon's Blood Gray ink, but the tattoo proprietor did not have any more. He was already using a gray pigment from another brand when required for gray portions of the tattoos he was performing on his patrons. The investigators did no comparison (microbiological culture) studies of this gray ink, nor did we attempt to culture Dragon's Blood ink of other colors such as blue, red, or yellow because none of the tattoo proprietor's customers had experienced any difficulties with untoward dermatological manifestations from these other inks.

Another patient developed a polyarteritis syndrome, which symmetrically affected his wrists, ankles, and knees. Initially, the patient was on antibiotics for 3 weeks, with insufficient relief of the papular rash in the gray portion of the tattoo. The symptoms were so severe the patient was treated with systemic steroids and antibiotics, which eased his polyarteritis symptoms, and he was slowly tapered off the steroids.

In early January 2009, an attempt was made to contact each of the tattoo customers to determine if there had been any improvement or other change to their condition. The investigators hoped to learn that the patients' symptoms had completely resolved. Three patients could not be contacted for followup. The eight patients contacted were notified of the contaminants found within the "Dragon's Blood Gray" ink and encouraged to seek medical evaluation and treatment.

Two of the patients experienced complete resolution of their initial dermatologic condition. Unfortunately, this was not the case for all the patients. Six of the 11 people had a persistent, papular rash in the gray portion of their tattoo some 5 to 6 months after receiving their tattoo. The investigators recommended to the patients that they be seen immediately by their personal physicians to be reevaluated and treated. For five of the six patients who were still symptomatic but did not have sufficient medical insurance, the investigators gave them the names and contact numbers of physicians with SAMHD who could see them for a nominal fee. The investigators stressed the importance of doing so. Because the investigators were reassigned to a different area of their training program, they could not follow up on the patients still experiencing symptoms to determine if appropriate medical treatment for the NTM infection was obtained.

The tattooing process has the potential to cause multiple, different adverse reactions, from infection, to keloid formation, to hepatitis C (Ref 2-4). Even temporary tattoos have caused delayed hypersensitivity reactions as well as scarring and keloid formation (Ref 5). NTM skin infections caused by contaminated ink are not only difficult to diagnose, they may also be difficult to treat (Ref 4). Nontuberculous mycobacterial infections often present with an infection localized to a site of skin compromise such as a puncture wound. Yet when this infection is

treated with empiric antibiotics, it often fails to respond. NTM organisms can also be suspected to be the culprit when a wound infection does not seem to grow under routine culture techniques (Ref 6). Infections with NTM organisms may require prolonged treatment with specific antibiotics to heal, and patients may be left with nonhealing ulcers or wounds (Ref 1).

Adverse reactions to tattoos extend beyond contaminated ink. The pigments contained within tattoo ink are thought by some to be associated with tumor development such as granuloma formation, keloid formation, the development of sarcoid lesions, and even malignant melanoma (Ref 2,7,8). The mechanism may be due to chronic inflammation within the individual's skin induced by these pigments (Ref 9). Tattoos may even be an inducer of disease, as lichen planus, psoriasis, sarcoidosis, and systemic lupus erythematosus have been shown to develop within the borders of tattoos (Ref 10,11). Skin infections from the tattooing process can involve many different agents including viral organisms, such as human immunodeficiency virus and hepatitis B and C, and bacterial agents (Ref 11). Bacterial infections caused by inadvertent inoculation with methicillin-resistant *Staphylococcus aureus* during the tattoo process were reported in outbreaks associated with tattoo parlors (Ref 12).

Atypical mycobacterial infections can be problematic to diagnose based on difficulties in correctly isolating and growing out these slow-growing organisms. In fact, cultures may be negative for prolonged periods, and complicated testing, including polymerase chain reaction techniques, may be required to diagnose these infections (Ref 8). Empiric treatment with antibiotics may not be adequate to treat these infections and may require specific therapy based on sensitivity testing (Ref 13).

It may be wise to have state and or/federal guidance on requiring not only initial but periodic training and education in sterile technique for tattoo artists so that they can more safely practice their trade and do so while protecting their patrons from infection-related problems. Since tattooing is very popular among the young, and is another manifestation of high-risk behavior common in the adolescent age group, it would be best, in the authors' opinions, to obtain informed consent before any tattooing is performed, especially when there is no statute protecting a particularly vulnerable age group (under 21 years old) (Ref 14).

Another area of interest is the FDA's classification of the tattoo pigment as a "color additive" that requires approval under the Federal Food, Drug, and Cosmetic Act (Ref 2), yet no color additive is currently approved by the FDA for subcutaneous injection. This practice, which is potentially injurious to tattoo recipients due to the harm that might come from substances used as pigments, is occurring daily in the U.S. Before the FDA will regulate tattoo inks or the pigments in them, more evidence of safety concerns must be gathered (Ref 2), and this study is one step in that direction.

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